



US Army Corps  
of Engineers

# Upper Mississippi River - Illinois Waterway System Navigation Study

UMR-IWW System Navigation Study Newsletter

August 1997

Vd. 4 No.3

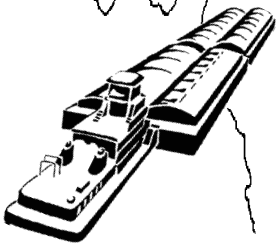


Minnesota  
Iowa



Wisconsin  
Illinois

Missouri



## Fishing For Answers Main Channel Mysteries Explored

**A**LTON, ILL. — There is always an air of suspense when a fisherman feels a tug on the line and prepares to haul it in. But on this sunny, humid day on the Mississippi River near St. Louis, the anticipation seems greater than normal as two young men in blue t-shirts and orange life vests quickly haul in the heavy net and flop their catch onto the flat, slanted surface of the aluminum boat.

"Holy cow! We've got something huge," exclaims Chad Dolan as he takes a closer look at the nine-pound smallmouth buffalo, a plump, oval-shaped fish popular in local rivertown restaurants.

"We've got a smattering of different species," adds Dr. John Dettmers, the director of this crew, as the fish are placed into water-filled buckets. "This is great."



24-foot research boat, the Quillback

It has already been a long day on the river as the team of fisheries biologists complete the fourth and final "trawl" of the day. As contractors for the study of adult and larval fish, one of four direct environmental effect studies being done for the Corps of Engineers Navigation Study, their job is to inventory fish in the main channels of the Mississippi River and the Illinois Waterway, concentrating on 13 sites near the busy confluence of the two giant rivers. They then will work to determine:

- How many fish are spending time in the main navigation channels
- What types of fish are most abundant there and during what river conditions
- And whether any fish are being killed or injured by commercial tows

The findings are not yet complete since the collection of fish will continue into September. But in 1996, they collected 3,100 fish representing 24 different species in the main navigation channels. Of those, between eight and 10 (.3 percent) were injured by propeller strikes of one form or another, said Dettmers, an aquatic ecologist with a Ph.D in zoology. Most of the injured fish were gizzard shad, a small, abundant fish eaten by game fish.

However, the group also is collecting and examining larval fish, newly-hatched fish so small they are being

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identified and measured with a microscope and an attached digitizing pad that measures each fish via computer. Because they are nearly microscopic, it is difficult to tell if the larval fish were killed or injured by commercial boat traffic. But because they drift with the current and are located near the river's surface, researchers hypothesize they may be killed or injured if they come into contact with a propeller or boat turbulence. Separate lab studies examining the impacts of propellers on larval fish will provide additional information on the impacts of passing tows. Further analysis will look at what impact, if any, that might have on the adult population of the various species.

## "Sturgeon Day"

On a recent outing, Dolan, Dettmers and Randy Claramunt, a larval fish specialist who joined the team this spring, collected close to 70 adult fish, mostly shovelnose sturgeon with a few smallmouth buffalo and freshwater drum mixed in. A couple of tiny fish could not be quickly identified and were bottled up to be taken back to the lab for identification.

The crew nicknamed this outing "Sturgeon Day" because of the dominance in the catch of the mid-sized fish that resembles a small shark and features a shovel-shaped nose, rows of bony plates and dates back to the prehistoric Cretaceous period. The bottom dweller was the sixth most commonly caught fish during the 1996 field season. On the second fish collection of the day, the team also found three sturgeon with an injury or defect, one with a bent backbone and another with a small chunk taken out of its nose. All were old wounds that had healed, and the crew could not identify the nature of the injury, Dettmers said.

One of the main goals of the study is to collect samples from behind passing tows to check for the presence of injured fish. While other days result in abundant sampling opportunities, the river traffic is light on this day. The team passes only two commercial tows over an eight-hour period and takes only one sample from the propeller stream of a tow. As the tow boat Afton closes in on the research boat, the three men leap into action like a well-trained pit crew, quickly checking temperature, flow rate and clarity of the muddy water characterizing this portion of the river. Those factors may later be shown to contribute to the type and concentration of fish they identify.

The boat then picks up speed, circling around as the tow pushing 16 barges upstream passes on the left. Dolan and

Claramunt drop the 100-pound steel plates that hold the trawl into place, and they carefully straddle the attached weights so they don't get pulled overboard.



*Claramunt & Dolan of the Illinois Natural History Survey pull up fish.*

Meanwhile, Dettmers helps release the net with a built-in hydraulic cable system built into the 24-foot research boat called the Quillback, designed especially for the study, with special safety features and radar. When they reach about five miles per hour, the cruising or "trawling" speed during fish collection, the net is in position along the river bottom and spread to a U-shape with an opening of about 15 feet wide and six feet high.

After collecting fish for 20 minutes in the wake of the tow, the men pull in an even 20 fish, none injured. All are then examined, weighed, measured and returned to the river.

While the same basic process is repeated hundreds of times during a field collection season, the researchers say they are never bored. They never know what surprises a net full of fish will bring.

## Early Findings

The team has caught two rare species listed as threatened or endangered on several state lists, including the blue sucker and the lake sturgeon, which can grow to a length of eight feet. Other surprises, Dettmers said, include the fact that a few fish commonly thought to inhabit only backwater or flood plain areas — the shortnosed gar and black crappie, for example — were found in the main channel.



*Above: Smallmouth Buffalo fish weighs in.  
Below right: Shovelnose Sturgeon is measured.*

The most commonly caught fish in the 1996 field season was the gizzard shad, a member of the herring family. The other most abundant fish in the 1996 sampling were the freshwater drum; channel catfish; smallmouth buffalo; and mooneye.

While only a small number of fish injuries or deaths have been detected, Dettmers cautions against any early determinations. The net carves a narrow path through the water, sampling only a portion of the fish that may have passed through the propeller stream. Future modeling will help show how the numbers expand out into the larger populations of fish, he said.

If the study shows there is significant impact to fish from passing barges, "we'd have to find ways to avoid, minimize or mitigate that impact," said Ken Barr, Technical Manager of the Navigation Study's environmental work group.

Regardless of the findings, what is exciting to the trio of researchers is the fact the study is looking at the largely uncharted waters of main channel fish life.

We just don't know a lot about what's out in the main channel because it's a very difficult place to sample, requiring substantial financial and time investment, Dettmers said.

"As a result, a lot of the information we're collecting hasn't been gathered before," he said. "The conventional wisdom is the main channel is a biological desert. We're finding that's probably not the case and that, in fact, the main channel is a pretty lively place to be." ♦

Species	Number Collected Aug.-Dec. 1996
Gizzard Shad	1,020
Freshwater Drum	897
Channel Catfish	278
Smallmouth Buffalo	277
Mooneye	150
Shovelnose Sturgeon	128
Common Carp	124
Blue Catfish	67
Bigmouth Buffalo	53
Sauger	18
White Bass	15
Quillback	15
Flathead Catfish	9
Lake Sturgeon	9
River Carpsucker	8
Black Buffalo	5
Blue Sucker	3
Highfin Carpsucker	3



*photos by Mary Tymoshuk*

## Small-Scale Measures: An In-Depth Look channel improvements; industry self-help measures explored

A scale model of a lock and dam, complete with more than a mile of flowing river and remote-control towboats has provided at least one surprise for engineers screening a variety of possible navigation improvements.

While looking at large-scale (new lock construction) measures at the Corps of Engineers Waterways Experiment Station in Vicksburg, Miss., modelers found that improvements to an approach channel could provide more time and safety benefits than originally thought. A variety of structures including dikes and guardwalls, all designed to realign the channel and improve the path of a tow as it enters a lock, are potential features of the approach channel measure under consideration.

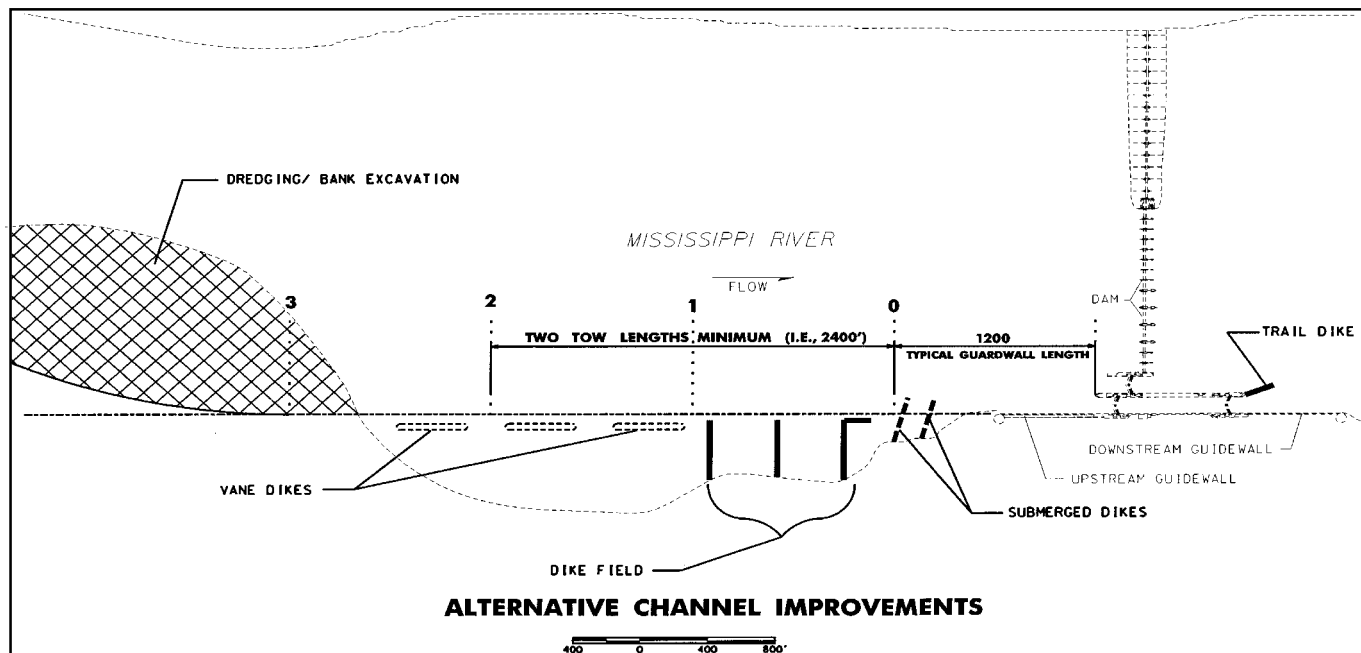
There now are a total of 18 small-scale measures on the list, with a variety of possible channel improvements considered as one measure. Previous newsletter issues have discussed the use of powered traveling keels, extended guidewalls, helper and switch boats and adjacent moorings.

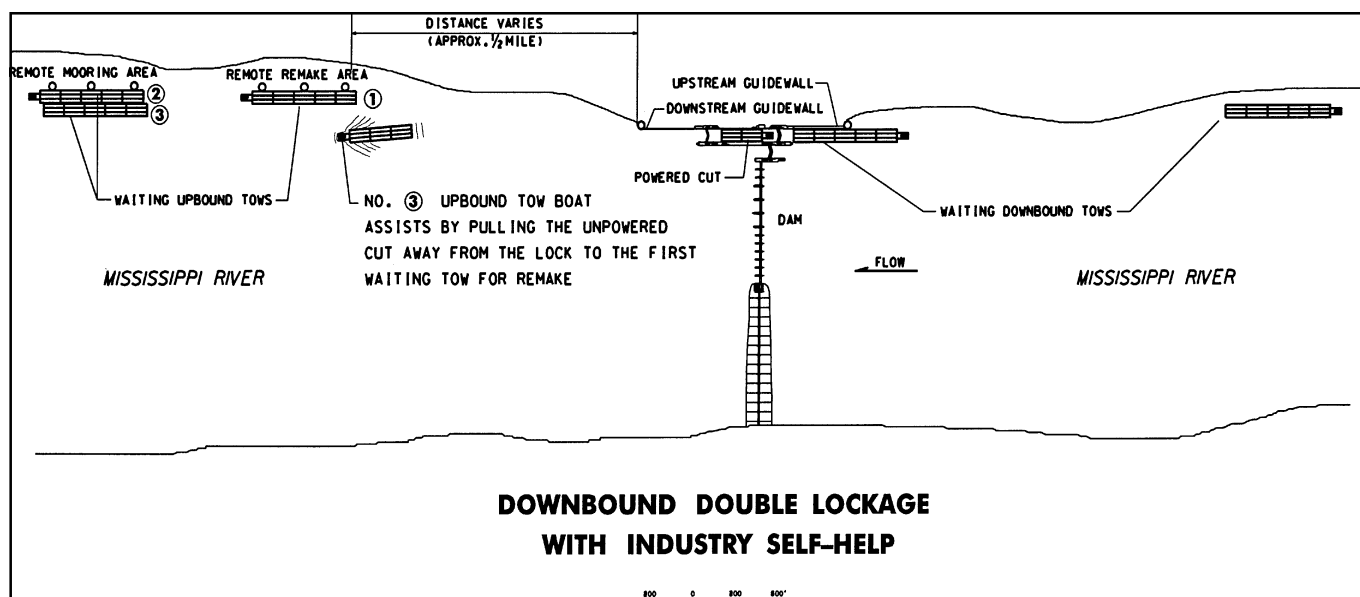
The potential benefits of **APPROACH CHANNEL IMPROVEMENTS** were identified when modelers were physically placing a 1:120 scale model lock in various locations within the simulated dam. In the process, they were initially unable to find a way to get a towboat into the lock safely because of the severe outdraft or current, said Denny Lundburg, a member of the Engineering Work Group. When they added structures that control the river flow, they were able to more easily maneuver tows into the lock.

"It became apparent that channel improvements could significantly reduce approach times plus make conditions safer," Lundburg said.

Channel improvements are very site-specific and include a matrix of possible physical improvements to the approach channel. They may be one way to help the locks, built in the 1930s, better handle the length of today's tows, which often have difficulty aligning with the lock chamber.

Initial Corps analysis indicates approach channel improvements (dike fields, submerged dikes, vane dikes, channel widening, dredging) can save from 2 percent to 33 percent of the current commercial tow approach time, depending on the location, combination of improvements and river conditions. The greatest estimated savings of 33 percent would come from a combination of channel improvements and a guardwall located as a 1,200-foot upstream extension of the riverside lock wall.





The improvements are relatively expensive when compared to other small-scale measures. Cost estimates, not including delays to commercial navigation during construction or potential environmental mitigation costs, range from an average of \$2.4 million for channel improvements alone to \$22 million for the combination of channel improvements and riverside guardwall that brings the greatest time savings. However, initial analysis has shown they may still be a viable option for reducing delays when compared to the relatively higher cost of building a new lock.

At the other end of the cost spectrum is **INDUSTRY SELF-HELP**, another small-scale measure being given a closer look by the study team. The measure relies on the navigation industry tows providing help to one another, without the assistance of lock personnel or equipment. Industry self-help is already put into practice occasionally on the Upper Mississippi-Illinois Waterway system, but could be put to wider use.

When self-help is implemented, a waiting tow will tie off its own barges and begin assisting other tows during a double-lockage, which occurs when a 1,200 foot tow goes through the existing 600-foot lock.

A double-lockage requires a tow to send half its barges through the lock, unpowered. The powered cut (the half still attached to the towboat) would then go through the lock with the remaining barges, then reconnect, often tying up the lock during the entire process.

When self-help is implemented, an assisting towboat would not just wait in line. Instead, it would act in a way similar to the "switch" boat outlined in recent issues of the newsletter, removing the unpowered cut from the lock and taking it to an area away from the guidewall for remaking (reattachment to the powered cut). That leaves the lock open for the next, waiting tow.

The self-help policy, developed in coordination with industry, is applied currently on an "as needed" basis — when several tows are waiting to use the lock. If delays continue to increase, the River Industry Action Committee, a group of industry representatives who help coordinate navigation issues with the Corps and other agencies, is asked to help implement a more extensive self-help policy.

If used as a small-scale measure, the policy could be expanded for use at additional locks and dams or enacted when a smaller number of boats are waiting. The need to provide mooring cable for remote areas is also being evaluated.

The policy eliminates the delay that occurs when tows reconnect inside the lock and eliminates the need for the Corps to provide tow haulage equipment. However, it requires significant coordination and cooperation among various towboat companies.

The use of industry self-help as a way to extract the unpowered cut and allow the reconnection process of a double-lockage to take place away from the lock would save an estimated 13 to 25 minutes. ♦



US Army Corps  
of Engineers

August 1997

UPPER MISSISSIPPI RIVER - ILLINOIS WATERWAY SYSTEM NAVIGATION STUDY  
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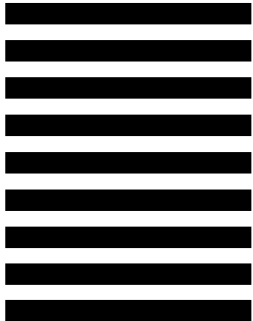
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# From Artifacts - Zebulon Pike

## River's Rich History Documented

From underwater shipwrecks to buried Native American artifacts, much of the history of North America is preserved along the flood plains of the Upper Mississippi River. And that history is being uniquely documented as part of the Navigation Study.

Even the locks and dams themselves — the focus of the study efforts — are between 50 and 60 years old and eligible for the National Register of Historic Places, says Ken Barr, technical manager of the Historic Properties Work Group. If the study determines that any construction is needed on the locks, Barr said, efforts will be made to pre-serve as much of the historic fabric as possible and to make sure the new comple-ments the old.

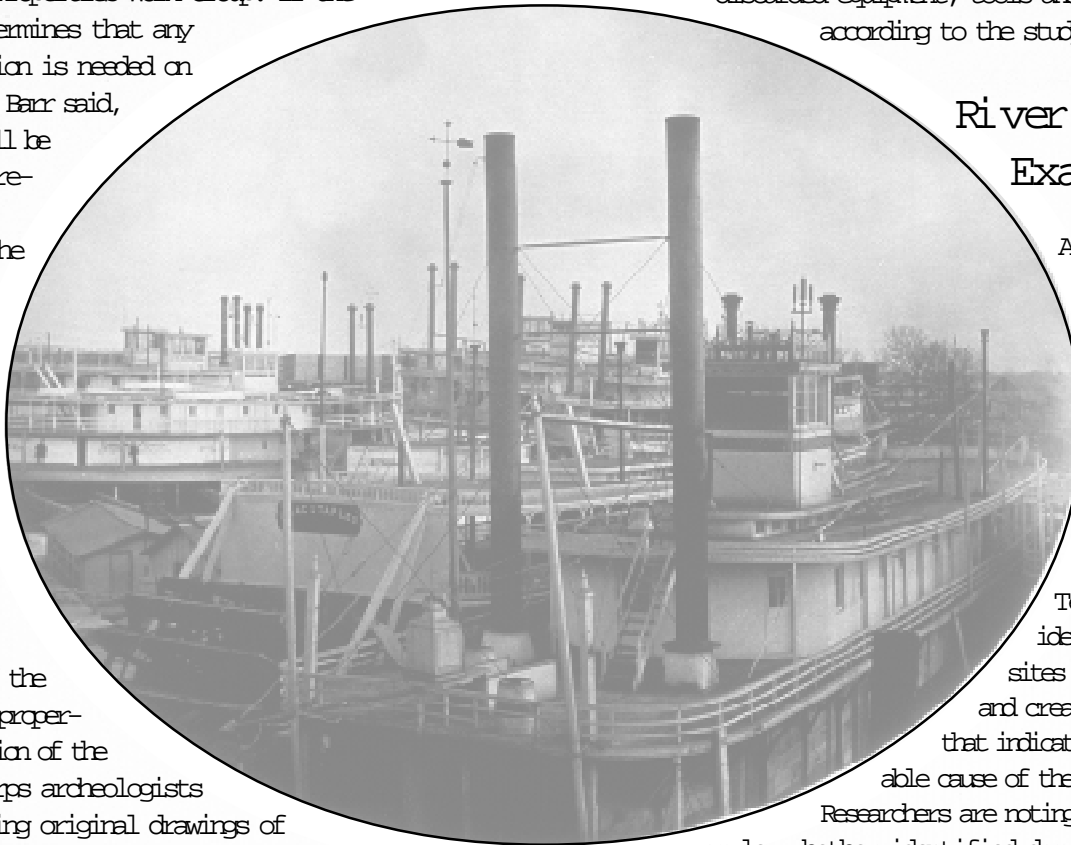
As part of the "historic prop-erties" section of the study, Corps archeologists are studying original drawings of the locks, looking at original photos and even watching movies from the 1930s that recorded the construction of the locks and dams.

Other areas of study include a recording of under-water historic properties as well as all the known archeological sites on shorelines, particularly those experiencing erosion.

A draft report entitled "An Investigation of Sub-merged Historic Properties in the Upper Mississippi

River and Illinois Waterway" was recently com-pleted. It identifies 138 sunken boats, structures and significant navigation markers including the Kahlke Boatyard of Rock Island, Ill., built in the 1800s, and the Grey Eagle, a famous sidewheel racing vessel lost in 1861 when it hit a pier and sunk.

The Kahlke Boatyard, established in the 1880s, was home to a number of famous wooden steamboats and was known for its high quality construction. Aban-doned in the late 1960s, the site may be rich with discarded equipment, tools and boat relics, according to the study findings.



## River Impact Examined

Another study still underway is looking at impacts to the river's archeologi-cal sites based upon a review of literature.

Teams have identified which sites are eroding and created a database that indicates the prob-able cause of the erosion.

Researchers are noting, for ex-ample, whether identified damage was caused by waves or vandals digging up artifacts. Experts also are attempting to date each site and indicate the historic importance of each. This section of the study has been completed for the St. Paul and Rock Island districts along the Mississippi River; similar efforts are under-way for the St. Louis District from Pool 24 to Cairo, Ill.

Results of the literature review will be used in conjunction with the bank erosion study reported on in the last issue to determine potential impacts to archeological sites.



The final part of this study involves identification of potential archeological sites where future construction is proposed. Information on the damage potential of construction or channel dredging will be compiled.

The project is an exciting one, said Barr, because the flood plains of the Mississippi are basically an archeological refuge. The Mississippi has served as a transportation artery since the development of the floating craft. It was used by Native Americans to travel and transport goods as well as for hunting and fishing. French traders used the waterway to bring goods to trade, and later in history it was used by explorers to investigate the country's interior. Lieutenant Zebulon Pike, following the Louisiana Purchase in 1803, completed the first American exploration of the Upper Mississippi River. As development continued, the waterway became an important vehicle for the shipping and receiving of goods, and because navigation often was rough, many pieces of the river's history now lie on the river bottom.

The locks and dams themselves also changed the history of the region dramatically. There was an old saying before construction of the 9-foot navigation channel that if you fell into the river, you were more likely to break a leg than drown. During low water, for example, fish died, water became stagnant and undrinkable and typhoid and cholera epidemics flourished.

Today, the Upper Mississippi River lock and dam system comprises one of the largest historic sites in North America and has been recommended as a national historic corridor.

"So little land in the Midwest is in federal holding, that this is one of the few places the history is preserved," Barr said. "Much of the land has been exposed to urbanism and agriculture. The Mississippi River Valley provides a unique chance at attempting to understand what happened during the last 10,000 years." ♦



Opposite page: Henry Bosse photo of Kahlke Boatyard from the late 1800's  
Above: Construction on Lock & Dam 15 in September 1931

photos courtesy of the Rock Island District

## Work Group Updates

The Navigation Study team work groups are nearing completion of their individual study efforts and continuing the critical stage of information sharing as the study moves toward the formulation of alternative plans for improving river navigation.

Plans are being developed that will be evaluated in terms of engineering feasibility, economic viability and environmental acceptability. The process will lead to selection of a National Economic Development (NED) plan in April 1998. That plan is the one that maximizes net national economic development benefits after accounting for possible environmental impacts. However, the plan recommended to Congress (referred to by the Corps as the "recommended plan") will include public involvement and will be developed with significant input from the public and representatives from the five study region states.

The **PUBLIC INVOLVEMENT WORK GROUP** will play an important role in collecting and synthesizing public reaction to the proposed NED plan and already is working on plans for a series of public meetings that will cover the five-state study area currently scheduled in the summer of 1998. These meetings will be designed to give participants an update of the planning process and solicit input into alternative plan formulation and evaluation. The work group also will be coordinating the role of the Governors' Liaison Committee (GLC) in the plan formulation process. The committee, consisting of representatives of the five study team states, will play an active role, through a series of formal meetings, in defining the recommended plan.

The major focus of the **ENGINEERING WORK GROUP** has been the finalizing of both cost and performance data for the large- and small-scale measures still under consideration. This information is being summarized in a draft engineering appendix and will be used in conducting the economic analysis. Sections are organized around the current "baseline" (navigation impacts with only minimal operation and maintenance of the existing system); "future without-project" (system impacts if only minor improvements already authorized by Congress are made); and the "future with-project," (impacts to navigation if various large- or small-scale measures are implemented).

The **ENVIRONMENTAL WORK GROUP** held a meeting June 13 to coordinate endangered species concerns with the U.S. Fish and Wildlife Service. The group has identified 11 species of wildlife that could potentially be affected by navigation improvements. Those include species listed as federally endangered, threatened or with potential to be listed in the future.

In addition, the site-specific habitat assessment team, which is looking at the habitat-based impact of potential improvement measures, completed a final round of field data collection in early June. Information was gathered at all seven of the lower lock and dam sites, the primary emphasis of this assessment project. Efforts are underway to complete assessment of locks 11-19 on the Upper Mississippi River.

The **ECONOMICS WORK GROUP** continues interpretation of the recently-adopted unconstrained traffic forecasts. Further coordination with the Economics Coordinating Committee will occur to assist in applying the traffic forecasts to the plan formulation process.

The work group also is preparing to run the economic models, starting with determining what economically the river navigation system does for the nation without any improvements. The data will be used as a basis for evaluating the economic benefits of other plan proposals. In September, the economics work group will run the "without project" model, looking at economic benefits of improvements that can be made without further Congressional authorization. The small- and large-scale options under consideration will be examined as part of a preliminary assessment.

The **STUDY MANAGEMENT WORK GROUP** is working with the study team to complete the screening of large- and small-scale measures. The group also is working on an overall draft report outline and devising a strategy for fitting all sections of the report together.

The Study Management Group continues to coordinate the handoff of data from one work group to another. The Engineering Work Group, for example, is in the process of providing cost and performance data on various measures to the Economics Work Group for use in the economics models. The Environmental Work Group, on the other hand, will be getting traffic forecast information from economics and looking at how the projected increase in river traffic is likely to affect a variety of environmental concerns from wildlife habitats to archeological sites. ♦

# Motor Vessel Mississippi Tour

The Motor Vessel Mississippi, a Corps operated tow boat, is holding public meetings on-board as part of an annual tour. The public meetings are being held by the Mississippi River Commission and are being held in seven locations on the Mississippi River.

The meetings will have short speeches from Mississippi River Commission members and Corps of Engineers officials. A brief question and answer session will follow if time permits.

LOCATION	DATE / TIME
St. Paul, Mn. (Lambert's Landing)	11 Aug. 8:30 a.m.
Davenport, Ia. (Oneida Landing)	13 Aug. 3 p.m.
St. Louis, Mo. (Foot of Market Street)	15 Aug. 10:30a.m.
New Madrid, Mo. (City Front)	18 Aug. 9 a.m.
Helena, Ar. (Downtown Harbor Area)	19 Aug. 9 a.m.
Lake Providence, La. (Harbor Area)	20 Aug. 9 a.m.
Morgan City, La. (City Front)	22 Aug. 9 a.m.

## Upcoming Meetings

15

Upcoming Meetings

UMR-IWWS Nav. Study

Navigation Environmental Coordination Committee

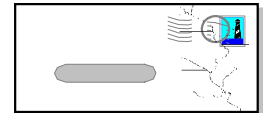
September 9 - Ramada Inn  
Moline, Ill.  
8 a.m. - 4 p.m.

Economics Coordinating Committee  
September 23 - Radisson Inn - St. Paul  
411 Minnesota Street  
St. Paul, Mn.  
10 a.m. - 3 p.m.

Governors' Liaison Committee  
September 23 - Radisson Inn - St. Paul  
411 Minnesota Street  
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3:30 p.m. - 6:30 p.m.

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If we do not receive a response, we will continue sending you a newsletter at the current address on our database. ♦

## River Change Examined

The system of locks and dams built by the U.S. Army Corps of Engineers in the 1930s created what the Mississippi River itself could not: a dependable nine-foot navigation depth from Minneapolis to St. Louis.

But what has the project done to the natural state of the Mississippi River?

That is being examined in the Navigation Study's "cumulative impacts study," a look at how the system has affected the river's environment, both positively and negatively, since the 1930s and what net overall effect it is likely to have in the future.

The first meeting of the analysis team was held May 5-6 in Rock Island. Members are using historic maps and photography as well as current river survey and other data to find out how the environment has changed since the dams were constructed. The study also will look at what environmental effects can be expected over the next 50 years.

The contractor team will be headed by Dr. Jeff Bradley and Dr. Ray Walton of WEST Consultants Inc., a Seattle-based consulting firm specializing in hydraulics and sediment transport. ♦

## Questions?

○ For general study information, call Mark Gmitro project manager, at 309/794-5279 or write to the address below, ATTN: CEMVR-PP-M or visit our home page at: [http://ncrsun7.ncr.usace.army.mil/nav\\_study.html](http://ncrsun7.ncr.usace.army.mil/nav_study.html).

○ For information on Public Involvement meetings, call the toll-free telephone number, 800/USA(872)-8822. Meeting announcements will be in the Public Involvement menu. Or call Kevin Blum, public involvement coordinator, at 612/290-5247, or write to the address below, ATTN: CEMVR-PD-C.

○ To be added to the mailing list for future newsletters, study updates, and meeting announcements, write to the address below, ATTN: CEMVR-PD-C, or call the toll-free telephone number and leave your information in the Public Involvement menu.

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